Management Strategies for Lettuce Drop in Arizona and California

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Lettuce Drop
The Pathogens: *Sclerotinia minor* and *S. sclerotiorum*

- over 1500 recorded hosts
- cottony rot, white mold, watery rot on fruits, flowers, leaves, stems, and roots
- growth is favored by moist conditions
- both species produce long-lived resting structures known as sclerotia
S. sclerotiorum

S. minor
Lettuce drop disease cycle

1. **Healthy lettuce plant**
2. **Ascospore cloud**
3. **Apothele from aecidial germination of sclerotia**
4. **Sclerotinia sclerotiorum**
5. **Eruptive germination**
6. **Mycelial contact of senescent tissue**
7. **Colonized crown tissue**
8. **Lettuce drop**
9. **Lettuce drop from mycelial contact of senescent tissue**
Eruptive Germination

A. *S. sclerotiorum*

B. *S. minor*
Lettuce drop disease cycle
Apothecium discharging ascospores
Integrated disease management of lettuce drop

- host resistance
- cultural practices
- chemical control
- biocontrol
Host Resistance

- No commercially acceptable cultivar exist
- Most breeding programs have focused on *S. minor*
  - “slow-dying” phenotypes have been described
- Little progress has been made on resistance to *S. sclerotiorum*
Cultural Practices

- **Crop rotation**
  - broccoli rotation for control of *S. minor*
  - fallow rotation for control of *S. sclerotiorum*

- **Irrigation**
  - Water management is key to reduced disease
  - furrow...sprinkler...subsurface drip
Chemical control of lettuce drop

- iprodione (Rovral)
- vinclozolin (Ronilan)
- dicloran (Botran)
- boscolid (Endura)
### 2003 Yuma Fungicide Trials

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Rate lb a.i./A</th>
<th><em>S. minor</em></th>
<th><em>S. sclerotiorum</em></th>
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</thead>
<tbody>
<tr>
<td>Rovral 4F</td>
<td>1.0</td>
<td>6.4</td>
<td>29.2</td>
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<tr>
<td>Ronilan 50DF</td>
<td>1.0</td>
<td>9.8</td>
<td>21.2</td>
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<tr>
<td>Endura 70WG</td>
<td>0.35</td>
<td>10.0</td>
<td>16.6</td>
</tr>
<tr>
<td>Serenade AS</td>
<td>4.0 qt prod.</td>
<td>10.0</td>
<td>27.4</td>
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<tr>
<td>Pristine 38WG</td>
<td>0.4</td>
<td>10.2</td>
<td>27.8</td>
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<tr>
<td>Botran 5F</td>
<td>1.87</td>
<td>10.8</td>
<td>24.6</td>
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<tr>
<td>Endura 70WG</td>
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<tr>
<td>Pristine 38WG</td>
<td>0.45</td>
<td>11.0</td>
<td>19.8</td>
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<tr>
<td>Botran 5F</td>
<td>3.75</td>
<td>11.0</td>
<td>28.2</td>
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<tr>
<td>Switch 62.5WG</td>
<td>0.43</td>
<td>11.6</td>
<td>27.6</td>
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<tr>
<td>Endura 70WG</td>
<td>0.35</td>
<td>11.8</td>
<td>37.2</td>
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<tr>
<td>Switch 62.5WG</td>
<td>0.56</td>
<td>12.4</td>
<td>30.0</td>
</tr>
<tr>
<td>Contans</td>
<td>4.0 lb prod.</td>
<td>12.6</td>
<td>12.8</td>
</tr>
<tr>
<td>Contans</td>
<td>2.0 lb prod.</td>
<td>16.8</td>
<td>18.2</td>
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<tr>
<td>Non-treated control</td>
<td>------</td>
<td>23.2</td>
<td>37.8</td>
</tr>
</tbody>
</table>

*each plot contained approx. 55 plants*
Benefits of biocontrol strategies

- complement other disease management strategies
- development of resistance unlikely
- cost effective
- few restrictions on use
- worker and environmental safety
- development of specialty markets
Objectives 2002-2003

- evaluate the efficacy of commercially available biocontrol agents for the control of lettuce drop
- evaluate the survival of biocontrol agents in the field
- evaluate the sensitivity of biocontrol agents to Botran, Rovral, and Ronilan
Evaluate the efficacy of commercially available biocontrol agents for the control of lettuce drop

- Contans - *Coniothyrium minitans*
- Soilgard - *Gliocladium virens*
- Trichodex, Supresivit, TRI 002 - *Trichoderma harzianum*
- Companion – *Bacillus subtilis*
- *Sporidesmium sclerotivorum*
Evaluate the efficacy of commercially available biocontrol agents for the control of lettuce drop

- RCBD with 4 blocks
- Biocontrol treatments plus one fungicide treatment plus control
- Two trials - high and low density of sclerotia - *S. minor* and *S. sclerotiorum*
- Two application schedules - pre-plant application and pre-plant plus side application
Evaluate the efficacy of commercially available biocontrol agents for the control of lettuce drop

- record incidence of lettuce drop
- record number and weight of marketable lettuce heads
Yuma Biocontrol Trials

Yuma S. sclerotiorum trial 2002

Yuma S. minor trial 2002

Yuma S. Sclerotiorum Trial 2003

Yuma S. Minor Trial 2003
Imperial Valley Biocontrol Trials

Holtville S. sclerotiorum trial 2003

Holtville S. minor trial 2003
Long-term Objective

To develop biocontrol strategies for desert winter lettuce production that are compatible with chemical and cultural management strategies.